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## **‘Aha Huliko’a Workshop Series**

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### **LONG-TERM GOAL**

The goal of the workshop series is to review the state-of-the-art, to identify areas of ignorance, and to make recommendations for future research on a topic or topics relevant to the Office of Naval Research.

### **OBJECTIVES**

The participants of the 2003 workshop “*Near Boundary Processes and their Parameterization*” were tasked to assess the state of our understanding of the physical processes that link boundary layers and the ocean interior and that may need to be parameterized in ocean models. These processes include wave radiation, flow separation, secondary circulations, subduction and other complex and not yet fully understood processes near the sea surface, lateral boundaries and the ocean bottom.

### **APPROACH**

Conduction of workshop and publication of workshop proceedings and a meeting report in a professional journal.

### **WORK COMPLETED**

A four-day workshop on “*Near Boundary Processes and their Parameterization*” was held from January 21<sup>st</sup> through the 24<sup>th</sup>, 2003, in Honolulu, Hawaii. The workshop brought together about twenty five observationalists, theoreticians, and numerical modelers. It was convened by the PI and Christopher Garrett. The workshop focused on the interaction of boundary layers with the interior. Topics included:

- (1) The control of the ocean by boundary processes,
- (2) Near boundary mixing,
- (3) Overflows,
- (4) Radiation into the ocean interior of internal tides and near-inertial internal waves,
- (5) Numerical simulations of processes,
- (6) Form drag,
- (7) Evolution of vortical flow structures,
- (8) Ekman dynamics,
- (9) Subduction,
- (10) The role of mesoscale eddies, and

- (11) Inclusion of boundary layers and near boundary processes in ocean models.

The lectures of the participants will be published in Müller and Henderson (2003). A summary of the workshop will appear in Müller and Garrett (2003).

## RESULTS

The ocean is mostly driven by forces that act at its boundaries and communicate their influence to the ocean interior via boundary layers and near-boundary processes. These layers and processes need to be understood and parameterized in a form that can be implemented into ocean models. The participants recognized:

- the heterogeneity of boundaries and processes there, making sampling and parameterization difficult,
  - the value of numerical studies of processes,
  - the value of transforming process understanding into useable and efficient but accurate parameterizations,
  - the importance of verifying proposed parameterizations by direct measurement of eddy fluxes rather than just by appealing to circumstantial evidence that a scheme “seems to work”.
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- Particular questions concerning poorly understood and important processes where observational and theoretical investigation would be fruitful included these:
  - what are the mechanisms of exchange between bottom boundary layers and the ocean interior – does restratification occur in situ or by vigorous exchange?
  - what is the eddy momentum flux near boundaries and what processes are responsible for it?
  - what is happening in canyons and abyssal channels, and what is the role of small-scale topographic features within them?
  - what processes determine the behavior of the region below the base of the surface mixed layer?

## IMPACT/APPLICATIONS

### PUBLICATIONS

Müller, P. and D. Henderson, 2003: “*Near Boundary Processes and their Parameterization*” Proceedings, 'Aha Huliko'a Hawaiian Winter Workshop, School of Ocean and Earth Science and Technology, Special Publication, (to be published)

Müller, P. and C. Garrett, 2003: *Near Boundary Processes and their Parameterization*. *Oceanography*, (submitted)